This listing of claims will replace all prior versions and listings of the claims in the application:

Listing of the Claims:

1-5. (Canceled)

6. (Currently amended) An apparatus for the measurement of isotopes at extremely low concentration and isotopes of very low abundance, the apparatus comprising an Inductively Coupled Plasma Source Mass Spectrometer equipped with a multi-dimensional detector system wherein ions transmitted by the mass spectrometer are detected with high selectivity; wherein the multi-dimensional detector system comprises:

a multi-slit assembly, wherein the mass spectrometer is coupled to the multi-slit assembly and wherein the mass spectrometer is a coincidence laser spectrometer comprising:

an optical detector coupled to the multi-slit assembly for specific detection of transmitted ions;

a voltage programmer flight tube coupled to the optical detector, the voltage programmer flight tube including a non-specific ion detector configured for the non-specific counting of transmitted ions, the flight tube further including an exit port at a first end thereof and a laser system at a second end thereof; and

a charged beam steering optics assembly positioned proximate the exit port of the flight tube.

7. (Previously Presented) An apparatus according to claim 6 wherein the multi-dimensional detector system comprises a plurality of sub-systems which provide a unitary response.

8. (Previously Presented) An apparatus according to claim 7 wherein the multi-dimensional detector system comprises two sub-systems.

9. (Currently amended) An apparatus according to claim 7 wherein the sub-systems comprise ~~a specific detector and a non-specific detector~~ the optical detector for specific detection of transmitted ions and the non-specific ion detector.

10. (Previously Presented) An apparatus according to claim 8 wherein the two sub-systems of the multidimensional detector system are correlated temporally with high resolution.

11. (Previously Presented) An apparatus according to claim 10 that provides co-incidence detection of transmitted ions.

12. (Currently amended) An apparatus according to claim 9 wherein the ~~specific~~ optical detector is based on optical spectrometry.

13. (Previously Presented) An apparatus according to claim 12 wherein the specific detection of the transmitted ions is *via* resonance scattering processes.

14. (Previously Presented) An apparatus according to claim 13 wherein the specific detection of the transmitted ions is *via* laser induced fluorescence.

15. (Previously Presented) An apparatus according to claim 13 provided with means for collecting and detecting resonantly scattered photons efficiently.

16. (Previously Presented) An apparatus according to claim 13 provided with means for the detection of the resonantly scattered photons with high temporal and spatial resolution.

17. (Previously Presented) An apparatus according to claim 16 wherein the detection of resonantly scattered photons is *via* an imaging photomultiplier tube.

18-19. (Cancelled)

20. (Previously Presented) An apparatus according to claim 6 provided with means for manipulating the mean ion energy thereby reducing the relative spread of the ion beams energies.

21. (Previously Presented) An apparatus according to claim 20 wherein the relative spread of ion beam energies may be manipulated to compress the optical bandwidth of the transmitted ions.

22. (Previously Presented) An apparatus according to claim 20 provided with means for accelerating or decelerating the transmitted ion beam to manipulate the average ion beam energy and consequently the relative spread of ion beam energies.

23. (Previously Presented) An apparatus according to claim 6 wherein a front-end collision/reaction cell is used to reduce the spread of the ion beam energies and compress the optical bandwidth of the transmitted ions.

24. (Previously Presented) An apparatus according to claim 6 provided with means for manipulating the ion beam energies to bring the transmitted ion beam into resonance within the detection volume of the optical detector.

25. (Previously Presented) An apparatus according to claim 24 provided with means for accelerating or decelerating the ion beam.

26. (Previously Presented) An apparatus according to claim 12 wherein the ion beam is accelerated to induce an optical isotope shift by Doppler shifting.

27-28. (Cancelled)

29. (Currently amended) An apparatus according to claim [[28]] 6 wherein the ~~dual~~ detector ~~assembly~~ system is mounted upon [[the]] an axial exit slit.

30. (Currently Amended) An apparatus according to claim [[27]] 6 wherein additional nonspecific ion detectors are mounted upon the multiple exit slit assembly.

31. (Currently amended) An apparatus according to claim 30 wherein additional nonspecific ion detectors are mounted upon [[the]] off-axis exit slits.

32. (Cancelled)

33. (Previously Presented) A method for detecting and quantifying low concentrations of stable and/or radioisotopes and/or low abundance isotopes which comprises analyzing a sample in an apparatus according to claim 6.

34. (Original) A method according to claim 33 wherein the species being detected is a radionuclide.

35. (Original) A method according to claim 33 wherein selectivity is enhanced by specific optical detection of transmitted ions.

36. (Original) A method according to claim 33 wherein selectivity is enhanced by specific isotopic selection via optical isotope shifts.

37. (Original) A method according to claim 33 wherein selectivity is enhanced by inducing an optical isotope shift by acceleration of the transmitted ions with subsequent Doppler shifting.

38. (Original) A method according to claim 33 wherein selectivity is enhanced by optical probing of hyperfine splitting.

39. (Original) A method according to claim 33 wherein nonspecific background is reduced by co-incidence detection of transmitted ions with subsequent improved detection limit.

40-41. (Cancelled)

42. (Currently Amended) The apparatus of claim [[40]] 6, further comprising a second non-specific ion detector mounted on the multi-slit assembly.

43. (Currently Amended) The apparatus of claim [[40]] 6, wherein the optical detector is configured to detect transmitted ions by resonance scattering.

44. (Currently Amended) The apparatus of claim [[40]] 6, wherein the optical detector is configured to detect transmitted ions by laser induced fluorescence.

45. (Previously Presented) An apparatus as claimed in claim 6 for the ultra low level determination of radionuclides.

46. (Currently Amended) An apparatus as claimed in claim 6 ~~said apparatus comprising~~ wherein the optical detector comprises an optical spectrometer.

47. (Cancelled)

48. (Previously Presented) An apparatus as claimed in claim 46 wherein said optical spectrometer is adapted to provide highly selective and specific detection of ions transmitted by the mass spectrometer.

49. (Previously Presented) An apparatus as claimed in claim 48 wherein said optical spectrometer provides a high resolution detection system, which in conjunction with

conventional mass spectrometry, is capable of resolving ions of interest from interfering molecular ions of similar nominal mass to charge ratio.

50. (Previously Presented) An apparatus as claimed in claim 48 wherein said optical spectrometer provides a high resolution spectroscopy system, which in conjunction with conventional mass spectrometry, is capable of resolving ions of interest from atomic ions of similar nominal mass to charge ratio.

51. (Previously Presented) An apparatus as claimed in claim 48 wherein said optical spectrometer provides a high resolution spectroscopy system, which in conjunction with conventional mass spectrometry, provides very high abundance sensitivity.

52. (Previously Presented) An apparatus as claimed in claim 6 which comprises an Inductively Coupled Plasma Mass Spectrometry Coincidence Laser Spectrometer.

53. (Previously Presented) An apparatus as claimed in claim 6, said apparatus comprising a laser induced fluorescence spectrometer.

54. (Previously Presented) An apparatus as claimed in claim 46 wherein said optical spectrometer operates in time correlation with a second detector.

55. (Previously Presented) An apparatus as claimed in claim 6 which comprises an imaging spectrometer.

56. (Previously Presented) An apparatus as claimed in claim 55 wherein said imaging spectrometer comprises a sector mass spectrometer.

57. (Previously Presented) An apparatus as claimed in claim 56 wherein said sector mass spectrometer comprises a double focusing sector Inductively Coupled Plasma Mass Spectrometer.

58. (Previously Presented) An apparatus as claimed in claim 57 which comprises a collision/reaction cell to act as an ion bridge between a sampler/skimmer plasma interface and the mass spectrometer.

59. (Previously Presented) An apparatus as claimed in claim 57 which comprises means for effecting acceleration of ions to compress the optical bandwidth of the ions to be detected.

60. (Previously Presented) An apparatus as claimed in claim 6, adapted such that the abundance sensitivity of the spectrometer is improved.

61. (Previously Presented) An apparatus as claimed in claim 60 wherein an ion of interest is brought into resonance selectively.

62. (Previously Presented) An apparatus as claimed in claim 60 wherein the selectivity of the mass spectrometer is increased by selective excitation of one hyperfine branch of an ion of interest.

63. (Previously Presented) An apparatus as claimed in claim 60 wherein acceleration of the ions induces an isotope shift by Doppler shifting the resonant frequency of the low abundant ion away from the interfering major isotope.

64. (Currently Amended) An apparatus as claimed in claim 6 which comprises two-colour excitation schemes wherein [[the]] a metastable state is in resonance with a laser frequency ~~one of the laser frequencies~~.

65. (Cancelled)

66. (Previously Presented) A method for the measurement of isotopes at extremely low concentrations and isotopes of very low abundance which comprises analysing a sample in an apparatus as claimed in claim 6.

67. (Previously Presented) A method as claimed in claim 66 for the ultra low level determination of radionuclides.

68. (Currently Amended) A method as claimed in claim 66, wherein said optical detector of said apparatus comprises an optical spectrometer.

69. (Cancelled)

70. (Previously Presented) A method as claimed in claim 68 wherein said optical spectrometer is adapted to provide highly selective and specific detection of ions transmitted by the mass spectrometer.

71. (Previously Presented) A method as claimed in claim 70 wherein said optical spectrometer provides a high resolution detection system, which in conjunction with conventional mass spectrometry, is capable of resolving ions of interest from interfering molecular ions of similar nominal mass to charge ratio.

72. (Previously Presented) A method as claimed in claim 70 wherein said optical spectrometer provides a high resolution spectroscopy system, which in conjunction with conventional mass spectrometry, is capable of resolving ions of interest from atomic ions of similar nominal mass to charge ratio.

73. (Previously Presented) A method as claimed in claim 70 wherein said optical spectrometer provides a high resolution spectroscopy system, which in conjunction with conventional mass spectrometry, provides very high abundance sensitivity.

74. (Previously Presented) A method as claimed in claim 66 which comprises analysing a sample in an Inductively Coupled Plasma Mass Spectrometry Coincidence Laser Spectrometer.

75. (Previously Presented) A method as claimed in claim 66, wherein said apparatus comprises a laser induced fluorescence spectrometer.

76. (Previously Presented) A method as claimed in claim 68 wherein said optical spectrometer operates in time correlation with a second detector.

77. (Previously Presented) A method as claimed in claim 66, wherein said apparatus comprises an imaging spectrometer.

78. (Previously Presented) A method as claimed in claim 77 wherein said imaging spectrometer comprises a sector mass spectrometer.

79. (Previously Presented) A method as claimed in claim 78 wherein said sector mass spectrometer comprises a double focusing sector Inductively Coupled Plasma Mass Spectrometer.

80. (Previously Presented) A method as claimed in claim 79 wherein said apparatus comprises a collision/reaction cell to act as an ion bridge between a sampler/skimmer plasma interface and the mass spectrometer.

81. (Previously Presented) A method as claimed in claim 79 wherein said apparatus comprises means for effecting acceleration of ions to compress the optical bandwidth of the ions to be detected.

82. (Previously Presented) A method as claimed in claim 66, wherein said apparatus is adapted such that the abundance sensitivity of the spectrometer is improved.

83. (Previously Presented) A method as claimed in claim 82 wherein an ion of interest is brought into resonance selectively.

84. (Previously Presented) A method as claimed in claim 82 wherein the selectivity of the mass spectrometer is increased by selective excitation of one hyperfine branch of an ion of interest.

85. (Previously Presented) A method as claimed in claim 82 wherein acceleration of the ions induces an isotope shift by Doppler shifting the resonant frequency of the low abundant ion away from the interfering major isotope.

86. (Currently Amended) A method as claimed in claim 66 wherein said apparatus comprises two-colour excitation schemes wherein [[the]] a metastable state is in resonance with a laser frequency~~one of the laser frequencies~~.

87. (Cancelled)

88. (New) An apparatus for the measurement of isotopes at extremely low concentration and isotopes of very low relative abundance, said apparatus comprising an Inductively Coupled Plasma Mass Spectrometer equipped with a multi-dimensional detector system wherein ions transmitted by the mass spectrometer are detected with high selectivity, wherein the multi-dimensional detector system comprises a coincidence laser spectrometer coupled to an axial exit slit of the mass spectrometer, said coincidence laser spectrometer comprising:

a charged beam steering optic to couple the exit slit of the mass spectrometer to an entrance slit of the coincidence laser spectrometer;

a voltage programmer flight tube to accelerate or retard the ion beam and consequently interact that ion beam with a co-axial laser system in an optical detector system; and

a charged beam steering optic coupled to an exit port of the optical detector to direct the ion beam onto a non-specific ion detector configured for non-specific counting of the transmitted ions.